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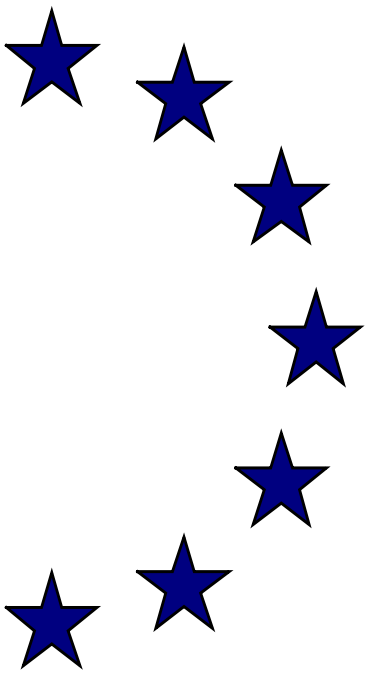

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The impact of the implementation of the Single Market Programme on productive efficiency and on mark-ups in the European Union manufacturing industry

by
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Abstract

This paper analyses the evolution of mark-up levels in the European Union (EU) manufacturing industry over the period 1987-2000 and links this evolution with price and cost developments. It provides an assessment of the impact of the completion of the Single Market Programme (SMP) on the productive efficiency and the market power of manufacturing firms and on prices of manufactured products. Results suggest that in the period prior to the completion of the SMP at the end of 1992, mark-ups of EU manufacturing firms deteriorated in line with a fall in prices, but that mark-ups recovered thereafter thanks to the realisation of productive efficiency gains. For society as a whole, there are welfare gains associated with the SMP, insofar as profit margins recovered after the initial shock delivered by the implementation of the SMP, while prices in real terms declined.

1. Introduction

In 1985, the European Commission's White Paper on the completion of the internal market launched an ambitious programme of product market liberalisation with a view to abolishing all barriers to the free movement of goods, services, people and capital flows within the European Union by the end of 1992. The Cecchini report (1988), which sought to measure the foreseeable effects of these measures, considered that the economic gains to be expected from the completion of the internal market would stem from the intensification of competition between producers, on the one hand, and from efficiency gains resulting from the reduction of trade barriers and from economies of scale induced by the expansion of markets, on the other hand. The intensification of competition on the goods and services markets together with the realisation of productivity gains were supposed to translate into lower product prices and thus to lead to a virtuous circle of reduction of inflationary pressures, of increases in the consumer's purchasing power, and of stimulation of demand favourable to the EU GDP growth.

Although the expected gains of the implementation of the Single Market Programme (SMP) were clearly identified, very few studies have sought to assess whether such gains were actually realised. The 1996 Internal Market Review of the European Commission provides an analysis up to 1992, i.e. the year of completion of the SMP. The conclusions of this study have therefore to be interpreted with caution. Various authors have analysed the impact of the SMP on the degree of competition and/or on productivity levels in the manufacturing industry, but they only focused on one or two countries: United Kingdom (Griffith, 2001), Italy (Botasso and Sembenelli, 2001), Belgium and the Netherlands (Konings et al., 1999 and 2001). Allen et al. (1998) and Notaro (2002) studied the impact of the SMP on industrial productivity or on price-cost margins using macroeconomic data. Based on Allen et al. and on Notaro estimates, the European Commission (2003) also provided an estimate of the impact of the SMP on the EU economy as a whole. However, no study using accounting-based data and covering the EU manufacturing industry as a whole has yet been carried out. The aim of this paper is to conduct such a study using the BACH database, which provides accounting and financial harmonised information on companies of 11 European Union Member States.

There are numerous studies analysing the relationship between competition and productive, allocative and dynamic efficiency[1]. Mark-ups or price-cost margins are often used as indicators of the degree of competition, the basic idea being that an increase in competition should translate into a reduction in the monopolistic behaviour of firms and then into a fall in prices and mark-ups or price-cost margins. However, the latter are also influenced by the evolution of costs. For instance an increase in competition may force incumbent firms to operate more efficiently. In that case a decrease in prices may be counterbalanced by a decrease in costs of a similar importance and thus the price-cost margin may not be reduced while competitive pressures have increased. That is the reason why it is important to look at both prices and costs developments for analysing mark-ups or price-cost margins, which has

[1] See for instance Ahn (2002) for a survey of the literature on these issues.

rarely been done. The purpose of this paper is also to shed light on this latter issue, while there will always remain a certain ambiguity in the explanation of the observed evolutions because of the interaction between the impact of the SMP and that of the trade globalisation which increased in the 1990s (Nagarajan, 1999).

Section 2 of the paper provides a review of the literature on the effects of the integration of national product markets on the productive efficiency of firms as well as on mark-ups and prices. Section 3 describes the methodology and the data used. In Section 4, the results of the analysis are presented and discussed. Section 5 concludes.

2. *Literature on the theoretical and empirical effects of product market integration*

The theoretical effects of national market integration stemming from the removal of non-tariff barriers to trade were summarised in the Cecchini report (1988), which argued that the implementation of the SMP would likely result in an increase in competition. Stronger competition would in turn have the two following effects: on the one hand, a drop in prices and in mark-ups (allocative efficiency gains); on the other hand, an increase in productivity translating into a fall in the production costs (productive efficiency and dynamic efficiency gains).

Box 1. Efficiency gains and competition.

Three categories of efficiency gains associated with an increase in competition stemming from the removal of entry barriers can be distinguished:
- Allocative efficiency gains. When there are barriers to entry, incumbents producers have market power and prices deviate persistently from marginal costs. Consequently, the total output is kept below its socially optimal level. An increase in competition reduces firms' market power and prices are set closer to marginal costs. More product market competition can also lead to a more efficient inputs (labour and capital) allocation as lower productivity firms exit and market shares move from lower productivity to higher productivity firms.
- Productive efficiency gains. Weak competition does not incite firms to operate efficiently by reducing overstaffing and high wages or by seeking new growth opportunities. An increase in competition incites firms to produce at lowest cost.
- Dynamic efficiency gains. An increase in competition also acts as a stimulus for firms to develop product and process innovations and hence to speed up the move to the modern technology frontier. This issue is still debated in the literature. On the one hand, the endogenous growth and industrial organisation literatures suggest that increased product market competition lead to reduced innovative activity, as more competition reduces the monopoly rents that reward successful innovators. On the other hand, endogenous growth models extending the basic Schumpeterian model by allowing incumbent firms to innovate predict that more product market competition may end up fostering innovation as competition may encourage R&D investments aimed at "escaping competition". Moreover, there is increasing evidence against the view that firms enjoying significant market power plough back excess profits into higher rates of R&D and innovation (Ahn, 2002).

2.1 Integration process, prices and profits.

The integration of different national product markets is likely to induce allocative efficiency gains stemming from the reduction of monopoly rents. Indeed, an increase in competition induced by trade liberalisation will result in both an increase in the number of competitors in the market and, everything else equal, in a reduction of the market power of firms and, consequently, in a reduction of prices and mark-up levels (Sutton, 1991; European Commission, 1996; Bottasso and Sembenelli, 2001). This may happen even in the absence of entry or in the case of only a few entries into the market, because entry is possible (European Commission, 1996).

Most empirical studies which aimed to test the links between the degree of market opening and/or the degree of competition, on the one hand, and the profitability level of firms, on the other hand, have found - since the pioneering works of Bain (1951 and 1956) - a negative relation between these two variables thus confirming the theoretical analysis (Schmalensee, 1989). Jacquemin and Sapir (1991), for instance, showed that the European national industrial sectors that were protected from intra EU competition by important non-tariff barriers benefited in the early 80's from abnormally high profitability levels. More recently, Oliveira Martins et al. (1996) found that there was no correlation between the degree of market concentration and the level of mark-ups but that there was a significant negative correlation between the latter and the entry rates in a market. The European Commission (1996) also showed that the implementation of the SMP led to an increase in competitive pressures in manufacturing industry resulting, in particular, in reductions in the price–cost margins. Allen et al. (1998) came to the same conclusion. In addition, a number of studies covering various sectors of the economy have found a positive relationship between the degree of concentration and the level of prices (Schmalensee, 1989).

2.2 Integration of national product markets and productivity.

There are three types of efficiency or productivity gains associated with the integration of different national product markets (European Commission, 1996):

- First, efficiency gains may stem from the elimination of technical inefficiencies that are linked to an under-utilisation of technological and human resources. Indeed, an increase in competition is supposed strongly to encourage incumbent firms to reduce both managerial and organisational "slack" (Binder, 1983; Willig, 1987) and then to increase productive efficiency. These efficiency gains can also stem from the fact that an increase in competition raises the probability of bankruptcy. Consequently, managers have an incentive to step up their efforts to avoid such a failure (Schmidt, 1996; Aghion and Howitt, 1996; Nickell et al., 1997).

- Second, efficiency gains may also result from economies of scale and scope (European Commission, 1996).

- Third, an increase in competition is also likely to induce dynamic efficiency gains by fostering product and process innovation (Bottasso and Sembenelli, 2001; European Commission, 2003).

On the whole, productivity in industrial sectors is expected to increase as a result of a rise in competition both because of a greater productive efficiency of incumbent firms and also because of the death or market exit of the least efficient firms (Grilliches and Regev, 1995; Bottasso and Sembenelli, 2001).

A number of empirical studies have sought to test the effects of trade liberalisation or of an increase in competition on the productivity level of industrial firms. These studies generally conclude that there is a positive relation (Nickell et al., 1997), either with respect to the impact of a trade barrier removal (Harrison, 1994; Mac Donald, 1994), or with respect to the impact of an increase in competition (Caves and Barton, 1990; Haskel, 1990; Green and Mayes, 1991; Nickell et al., 1992; Nickell, 1996; Pilat, 1996). Griffith (2001) also shows that the increase in product market competition brought about by the implementation of the SMP led to an increase in overall levels of efficiency, but that these efficiency gains occurred more particularly in firms where management and ownership were separated (principal-agents type of firms), suggesting then that product market competition can play an important role in reducing agency costs[2]. Using American data, Jagannathan and Srinivasan (2000) came to the same conclusion.

3. Methodology and data used

3.1 Measures of productive efficiency and of mark-up

a) Measure of productive efficiency

Productive efficiency can be defined as the capacity for a given firm to allocate its resources in such a way that makes it possible to reduce or eliminate the under-utilisation of its production factors (Pilat, 1996). If productive efficiency and productivity are not identical concepts, they are nevertheless close (Sharpe, 1995) and a reduction of productive inefficiency can be associated with productivity growth (Pilat, 1996). Productivity is relatively easy to measure either by relating a measure of output to a single measure of input (single-factor productivity) or by relating a measure of output to a bundle of inputs (total factor productivity) (Schreyer and Pilat, 2001). Total factor productivity growth is generally measured by econometric techniques using the Solow (1957) method, that is the difference between the growth rate of an output and a weighted average of the growth rate of factor inputs (Oliveira Martins et al., 1996). However, productive efficiency is difficult to measure because it depends on various factors, some of them not being observable. In this respect, four factors can be identified as a source of efficiency gains:

- Intermediate consumption (raw materials and subcontracting). For instance, the reduction of the volume of raw materials used at constant production level, or the rise in production at constant volume of raw materials used in the productive cycle are

[2] Agency costs may be defined as costs induced by decisions taken by managers with the view to increasing their personal gratification or to reaching their own personal objectives (use of "free cash-flow") instead of being taken in order to maximise the net present value of the firm. Agency costs may also stem from the existence of managerial or organisational slack translating into a misuse of human resources.

one aspect of efficiency gains. This is often linked with process innovation or with product innovation. These efficiency gains are however difficult to measure through accounting data, as raw materials are recorded at their purchase price. Consequently, a decrease in the volumes used can be compensated by a rise of raw material prices, and conversely.

- Labour force. A reduction in the labour force at constant production level or an increase in production at constant labour force makes it possible to increase labour productivity.

- Productive assets. Efficiency gains may result from a better use of the productive assets (not only machines and equipment but also current assets such as stocks) translating into a reduction of operating costs, i.e. costs resulting from the productive activity of the firm. These gains may come, for example, from new and efficient logistic management methods leading to a reduction of stocks.

- Lastly, organisational gains. The latter result from the adoption of a new and more efficient organisation within the company such as, for instance, new methods of production aimed at increasing the firm's reactivity and flexibility ("kaizen" or "lean-production" methods). Again, these organisational gains are not easily measurable through financial data. However, they influence labour productivity, since they reduce X-inefficiency (Leibenstein, 1966) which comes precisely from organisation, effort and competence problems (Pilat, 1996).

Because of the difficulty of calculating some of the factors leading to efficiency gains, the variation of the unit production costs is used as a proxy for the developments of productive efficiency within the manufacturing industry. Indeed, efficiency gains should translate, everything else being equal, into a reduction in unit production costs (Dierx and al., 2003).

The price index for manufactured goods for each country and for each year under review (information provided by the NEW CRONOS database) is used to calculate the growth rate of unit production costs (see annex 1 for the detail of calculations).

b) Measure of the mark-up

The mark-up is defined as the price over marginal cost ratio. It is generally acknowledged that a mark-up ratio exceeding unity is a sign of the existence of market power enabling firms to set prices above marginal costs and then to achieve monopoly rents (Oliveira Martins et al., 1996; Konings et al., 2001).

Numerous studies using macroeconomic databases have sought to measure the level of mark-ups within the manufacturing industry of various countries. Studies using macroeconomic databases generally make use of econometric techniques for estimating the mark-up ratio. Based on the methodology used for calculating total factor productivity, the so-called Solow residual, this technique basically consists of using a regression analysis with an output as dependent variable and the production factors, or inputs, as explanatory variables. The residual of the equation is considered

as a proxy of the Lerner index (B = p-mc/p)[3] which is a traditional indicator measuring the degree of competition. This methodology, first proposed by Hall (1986 and 1988), supplemented by Domowitz et al. (1988) then modified by Roeger (1995), makes it possible to indirectly estimate the mark-up ratio[4] (Oliveira Martins et al., 1996).

These studies focus on the profit margin level as an indicator of the monopoly power of a firm. Indeed, as a mark-up ratio exceeding unity is considered as proof of the existence of market power (Konings et al., 1999 and 2001), the latter translates into a positive marginal profit, i.e. p-mc > 0. However, as the marginal cost is unobservable, average variable cost is generally used as a proxy for marginal cost (Ahn, 2002). Estimates of the mark-up based on Roeger's method are in fact estimates of the price over average cost ratio (Oliveira Martins et al., 1996).

Some authors using accounting and financial databases use average cost, or even variable cost, as a proxy of marginal cost and calculate either a direct measure of the Lerner index (Nickell, 1996; Aghion et al., 2002), or a direct measure of the mark-up by calculating the "turnover/variable cost" ratio from aggregated accounting data (Griffith, 2001). Others use the ratio of gross operating profit over value added (Rivaud-Danset et al., 2001). The hypothesis according to which firms set prices as a mark-up over average costs is supported by results of surveys conducted within UK (Hall et al., 2000) or American firms (Blinder et al., 1998) which showed that production costs, that is unit costs, were more widely used for price setting than marginal cost.

However, whatever the methodology used, there will always remain a certain ambiguity in the price-cost margin analysis[5]. Indeed, high price-cost margins can be interpreted as a consequence of low competitive pressures but in contrast they can also result from efficient behaviour of firms (Ahn, 2002). Thus Demsetz (1974) considers that high profit levels within an industry can be explained by good performances of firms, i.e. the ability - mainly of the largest firms - to produce at low costs. Similarly, Boone (2000) shows that an increase in competition does not necessarily translate into a reduction of the price-cost margin, in particular for the most efficient firms.

More generally, an increase in competition due to major waves of entries in the market may have more effects on prices than on profits, and therefore the mark-up may remain stable while prices may fall. Geroski et al. (1996) show in particular that this is likely to occur because incumbent firms have excess costs –such as managerial slack or rent sharing with the workforce- which can be reduced to compensate for lower prices. This latter argument could be a good explanation for the paradox mentioned by Konings et al. (2001) concerning the levels of mark-ups in the Dutch manufacturing sectors facing high import rates, that they found to be higher than in

[3] B: Lerner index; p = prices; mc = marginal cost.

[4] The relation between the mark-up and the Lerner index is as follows: p/mc = 1/ (1-B).

[5] In this study, mark-up and price-cost margin are considered as synonyms since it is generally acknowledged in the literature that average cost or unit cost (uc) is a proxy for marginal cost (Ahn, 2002).

sectors where import rates were low: if the intensity of competition results in a fall in costs greater than the fall in prices, then profit (the price-cost margin) increases.

Consequently, it is important to analyse the respective contributions of price and cost developments in the variation of the price-cost margin.

Therefore, the evolution of the price-cost margin ratio, of prices and of costs have to be analysed simultaneously to assess the impact of a increase in competition on the market power of firms and to see whether the market power of EU manufacturing firms has been reduced by an increase in competition induced by the implementation of the SMP. These indicators are deflated indexes. For that purpose, the GDP deflator indicator available in the AMECO database was used. This makes it possible to compare price and cost trends on the basis of a constant monetary unit over the 14 studied years.

In an analysis making use of accounting information, the price-cost margin can be calculated directly:

$P * Qs / UC * Qs = P / UC,$

with Qs = quantity sold;
P = price; and
UC = unit cost. (see annex 1)

This calculation is carried out at the level of the manufacturing industry in the 8 studied countries. Unit cost is calculated from information on variable and fixed costs. Fixed costs (depreciation on fixed assets + interest paid on financial debts) can be considered as a proxy for capital cost. The latter has to be taken into account in the calculation of the mark-up (Schmalensee 1989).

The cyclical behaviour of the mark-up ratio is an important element to take into account. However, as mentioned by Oliveira Martins et al. (1996), both in the theoretical literature and in empirical studies, there is no consensus on the links between the mark-up and the business cycle. For example, the models of Weitzman (1982) and of Rotember and Saloner (1986) predict that mark-ups are contra-cyclical, whereas the models of Kreps and Scheinkman (1983) and Green and Porter (1984) predict they are pro-cyclical. Thus, the issue of the cyclicality of the mark-up is mainly an empirical one. For instance, some authors demonstrated the existence of a contra-cyclical behaviour of the mark-up in the American manufacturing sectors (Bils, 1987; Rotemberg and Woodford, 1992; Morrison, 1994) or in OECD countries (Oliveira martins et al., 1996), while others found opposite results for American (Domovitz et al., 1988), Canadian (Morrison, 1994), English (Haskell et al., 1995) and Spanish (Fariñas and Huergo, 2003) industries.

To test whether the mark-up has a pro or a contra-cyclical behaviour, the manufacturing production index (1995 = 100, NEW CRONOS data) was used as a proxy for the business cycle.

3.2 Data

Financial data used in this study come from the BACH database, which is managed by the European Commission (DG Economic and Financial Affairs). This database provides aggregated and harmonised financial statements for various sectors in thirteen countries, including Japan and the United States. Information is available for three size classes, twenty-three sectors or sub-sectors and fifty-three items from the balance sheet and profit and loss accounts. These items are presented in a structural form, i.e. in percentage of total balance sheet or of net turnover, which makes comparisons between countries possible. For certain countries, annual time series of over 19 years are available.

Accounting harmonisation is based on Articles 10 and 23 of the fourth EU Directive. This implies that harmonisation work remains concentrated mainly on the European countries. Therefore, the possibilities for comparing with American and Japanese data are relatively limited. Nevertheless, the BACH database provides a relevant layout for carrying out cross-country studies (Coeurderoy, 2001).

The analysis also makes use of other databases in order to complete the information taken from BACH. The NEW CRONOS database provided data on the raw material price index and on manufactured goods' price indexes by country[6]. The labour unit cost indexes in manufacturing industry were taken from the AMECO database. However, because of a mismatch between the sectoral breakdown available in BACH and the one available in AMECO and NEW CRONOS, it was not possible to carry out the analysis at the sector level.

Data are thus aggregated at the manufacturing industry level, all size classes together, and cover a fourteen-year period, from 1987 to 2000. This period of time makes it possible to compare the situation of the EU manufacturing industry before the completion of the SMP (from 1987 to 1992) and after it (from 1993 to 2000).

Owing to the fact that data used cover manufacturing industry as a whole for each country, the information taken from the BACH database are average indicators synthesising the situation of manufacturing companies in each country. To take into account the relative importance of each national industry, the variables have been weighted on the basis of the share of each national manufacturing industry in the combined value added of the manufacturing industries of the 8 countries (information taken from the AMECO database).

Data from eight European countries were selected: Germany, Belgium, Denmark, France, Finland, Spain, Italy, and Portugal. The other Member States of the European Union are not included in this study either owing to the unavailability of the data in BACH (United Kingdom, Greece, Ireland, and Luxembourg) or owing to incomplete series over the period under review (the Netherlands, Austria and Sweden). The sample comprises on the whole 104 observations: complete data over the whole period is available for four countries (Germany, France, Spain, and Italy). Data concerning the other countries is available either as from 1989 (Belgium and

[6] The producer price index was used as price indicator by Allen et al. (1998).

Finland), or as from 1990 (Portugal). For Denmark, data is available from 1987 to 1999.

Finally, all the variables have been transformed into indexes (1995 = 100).

3.3 Statistical methodology

Three analyses are made: one on the evolution of productive efficiency in the EU manufacturing industry, one on the price-cost margins developments in the EU manufacturing industry, and one on the price-cost margins evolution by country.

Each analysis combines both a descriptive analysis and a regression analysis. The descriptive analysis presents graphs showing the evolution over time of the indicators used. The regression analysis is carried out to estimate the evolution of productive efficiency or of price-cost margins adjusted for the influence of control variables, such as raw material prices for productive efficiency and the business cycle for price-cost margins (residual analysis). The evolution over time of the residual of the estimated equations is thus considered as a proxy for the impact of competitive pressures on the indicator concerned. In this study, the natural logarithms of the variables are used in the regression analyses.

As far as the analysis of price-cost margins is concerned, a correlation analysis as well as a second regression analysis are made to assess whether the influence of prices and of unit costs on the price-cost margin ratio has significantly changed between the period prior to the completion of the Single Market Programme (1987-1992) and the period after this completion (1993-2000).

Tables 1 to 3 summarise both the concepts used and their corresponding indicators according to type of analysis:

Table 1 – Concepts and indicators used for analysing productive efficiency evolution in the EU manufacturing industry

Concepts	Indicators (with indication of the data source)
Unit labour costs	*Real unit labour costs index* (AMECO data)
Productive assets efficiency	*Fixed assets/Turnover ratio* *Stocks/Turnover ratio* (BACH data*)*
Productive efficiency	*Unit production costs index* (UPCi ; BACH data + NEW CRONOS data)
Raw material prices	*raw materials prices index* (RMPi ; NEW CRONOS data)
Impact of competitive pressures on the evolution of productive efficiency	*Indicator based on the residual of the following equation:* $ln\ (UPCi) = \alpha 1\ ln\ (RMPi) + \alpha 2\ ln\ (INFLi) + Cst + \varepsilon$ With INFLi = GDP deflator index (proxy for inflation ; AMECO data) Each value of the indicator is computed as follows: V_i = weighted mean ($\varepsilon c_1, y_i + \varepsilon c_2, y_i + .. + \varepsilon c_8, y_i$) With V_i = value at time i ; i = time period (varying from 1987 to 2000); ε = residual; c_1 = country 1; c_2 = country 2; c_8 = country 8; y = year

Table 2 – Concepts and indicators used for analysing price-cost margins evolution in the EU manufacturing industry

Concepts	Indicators (with indication of the data source)
Mark-up ratio	*Price/marginal cost* (unobservable)
Price-cost margins	*Price/unit cost index* (P/UCi ; BACH data; proxy for the mark-up)
Deflated prices	*Deflated manufactured goods price index* (NEW CRONOS + AMECO data)
Deflated unit production costs	*Deflated unit production costs index* (BACH + NEW CRONOS + AMECO data)
Business cycle	*Manufacturing industry production index* (BCi ; NEW CRONOS data)
Intra-EU import competition (% of GDP)	*Intra-EU imports of goods excluding energy products index* (AMECO data)
Extra-EU import competition (% of GDP)	*Extra-EU imports of goods excluding energy products index* (AMECO data)
Price-cost margins adjusted for the influence of the business cycle	*Indicator based on the residual of the following equation:* $ln\ (P/UCi) = \alpha 1\ ln\ (BCi) + Cst + \varepsilon$ Each value of the indicator is computed as follows: V_i = weighted mean ($\varepsilon c_{1,y_i} + \varepsilon c_{2,y_i} + .. + \varepsilon c_{8,y_i}$) With V_i = value at time i ; i = time period (varying from 1987 to 2000); ε = residual; c_1 = country 1; c_2 = country 2; c_8 = country 8; y = year

Table 3 – Concepts and indicators used for analysing price-cost margins evolution by country

Concepts	Indicators (with indication of the data source)
Price-cost margins	*Price/unit cost index* (P/UCi ; BACH data; proxy for the mark-up)
Deflated prices	*Deflated manufactured goods price index* (NEW CRONOS + AMECO data)
Deflated unit production costs	*Deflated unit production costs index* (BACH + NEW CRONOS +AMECO data)
Price-cost margins adjusted for the influence of the business cycle	*Residual for each country of the following equation:* $ln\ (P/UCi) = \alpha 1\ ln\ (BCi) + Cst + \varepsilon$

4. Results and discussion

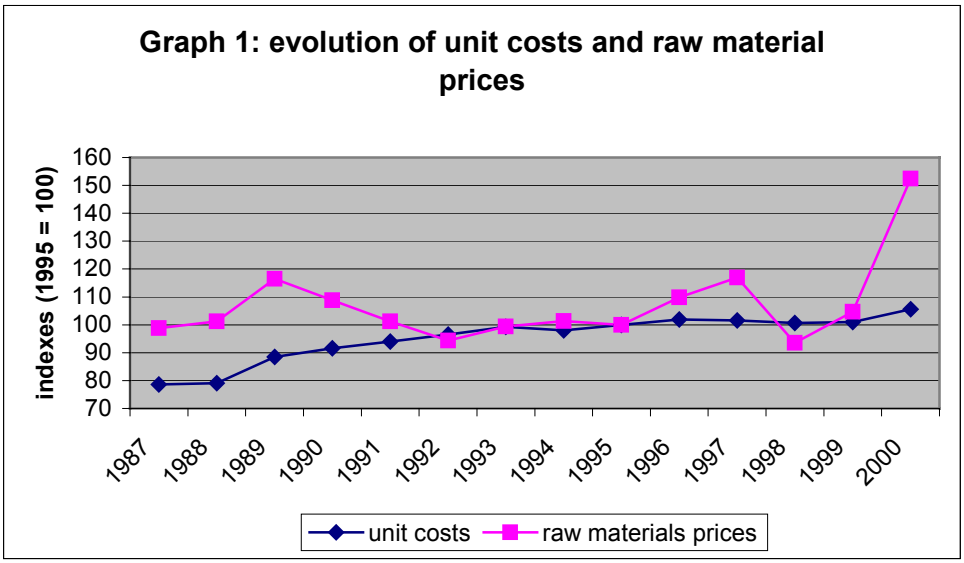
The basic idea is that if the implementation of the SMP, which took place in several stages between 1987 and 1992 (Bottasso and Sembenelli, 2001; Griffith, 2001; Aghion et al., 2002), has had the expected effects, then we should observe an increase in the efficiency gains as well as a decrease in the level of prices and mark-ups in the EU manufacturing industry as from the early 1990s (Cecchini et al., 1988; Bottasso and Sembenelli, 2001).

4.1 Productive efficiency and unit costs developments in the EU manufacturing industry during the 1990s

4.1.1) Descriptive analysis

Between 1990 and 1993, unit production costs in EU manufacturing industry increased while raw material prices fell, thus indicating a priori that no efficiency gains were made in this period of time (see graph 1). From 1994 to 1999, unit costs in the EU manufacturing industry remained overall stable, while the evolution of raw material prices has become more volatile as from 1996. The year 2000 was an exception because of the very strong rise in raw material prices.

Graph 1: evolution of unit costs and raw material prices



4.1.2) Estimation of the evolution of unit production costs adjusted for the influence of inflation and raw material prices

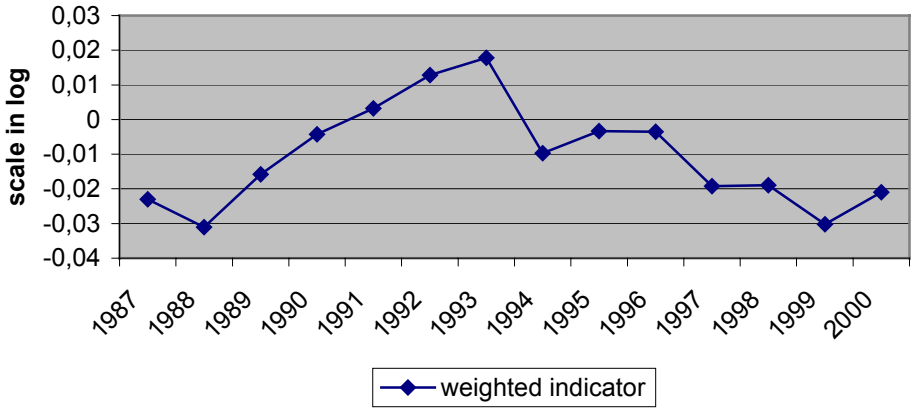
In order to be able to assess whether there has been efficiency gains associated with the implementation of the SMP, it is necessary to neutralise the evolution of unit production costs that is due to the evolution of raw material prices and of inflation. To this end, a regression analysis[7] was made with the unit production costs index (UPCi) as dependent variable and the raw materials prices index (RMPi) and the GDP deflator index[8] (INFLi) as explanatory variables:

$$ln\,(UPCi) = \alpha_1\, ln\,(RMPi) + \alpha_2\, ln\,(INFLi) + Cst + \varepsilon \qquad (1)$$

It was not possible to use variables expressed in real terms because no deflator for the raw material price index is available. Therefore, it was decided to make use of the nominal unit production costs index as dependent variable and to include an indicator of inflation in the equation.

Since we may reasonably consider that efficiency gains should translate, everything else being equal, into a reduction in unit production costs, the residual of the estimated equation can be used as a proxy for the evolution of productive efficiency. Graph 2 shows the evolution over time of the weighted indicator[9] computed from the residuals of equation (1).

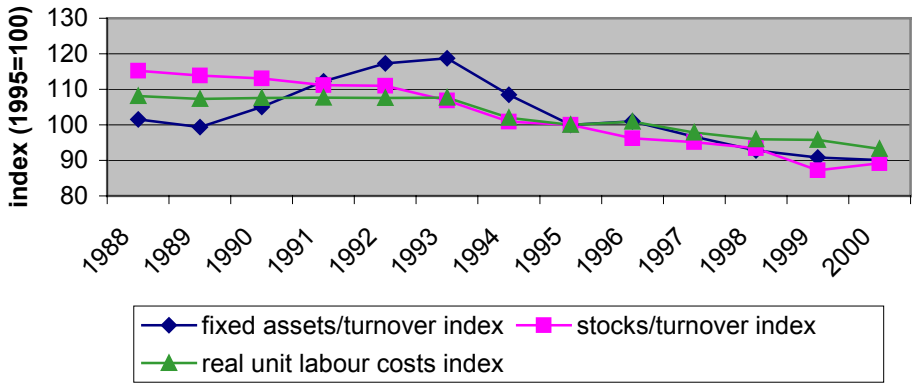
Graph 2: evolution of unit production costs adjusted for inflation and raw material prices



[7] See annex 2 for the results of the regression analysis.
[8] The GDP deflator is a proxy for inflation.
[9] The indicator is weighted on the basis of the share of each national manufacturing industry in the combined value added of the manufacturing industries of the 8 countries. See also table 1 for the method of computation of this indicator.

Graph 2 clearly shows that from 1988 to 1993 productive efficiency declined in the EU manufacturing industry since unit production costs adjusted for inflation and raw material prices increased. As from 1994, the opposite is true since we can observe in that latter year a clear break in the series followed by a negative trend until 2000, thus indicating the realisation of efficiency gains in this period of time.

Graph 3: Evolution of productive assets efficiency and real unit labour costs



Considering the sample period as a whole, efficiency gains observed as from 1994 resulted in particular from a reduction of variable production costs which, expressed as a percentage of turnover, fell in the EU manufacturing industry by approximately 1.4 percentage point between 1993 and 1999 in relation to the reduction of staff costs (European Commission, 2001). The evolution of real unit labour costs may be influenced by cyclical factors, i.e. the evolution of real wages may decline during economic downturns notably because higher unemployment rates tend to reduce the negotiating power of workers, and conversely. However, the evolution of real unit labour costs appears to be negative from 1994 to 2000 while manufacturing production increased markedly during this period of time (see graph 5). The fact that real unit labour costs declined while manufacturing production increased markedly could be explained –at least partly- by different elements: large enterprises having greater recourse to subcontracting and thus developing subcontracting networks comprising 'captive' SMEs, on which they could impose their price conditions; reallocation of part of the production to low-wage countries; wage restraint, especially in SMEs; redesigning of production methods aimed at increasing labour productivity (European Commission, 2001).

Efficiency gains resulted also from a better use of firms' productive assets, as shown in graph 3. As from 1993/1994 both the ratios of fixed assets over turnover and of stocks over turnover fell significantly, an indication that EU manufacturing firms increased the efficiency of their productive assets after the completion of the Single Market Programme.

Conclusions drawn from graphs 2 and 3 are in line with what Bottasso and Sembenelli (2001) already noted for the Italian manufacturing industry, namely that no productivity gains could be observed between 1988 and 1992. These results also support the thesis according to which the implementation of the SMP has incited European firms to take measures aimed at improving their productive efficiency. For instance, Griffith (2001) found that labour productivity as well as total factor productivity increased in UK industry between 1993 and 1996. Notaro (2002) also provided strong support for the positive impact of the SMP on the productivity of industries considered as highly sensitive to the SMP. Finally, using Notaro's results as an assumption, the European Commission (2003) came to the conclusion that the increase in industrial productivity reached around 0.5% in the period following implementation of the SMP when compared with the previous period.

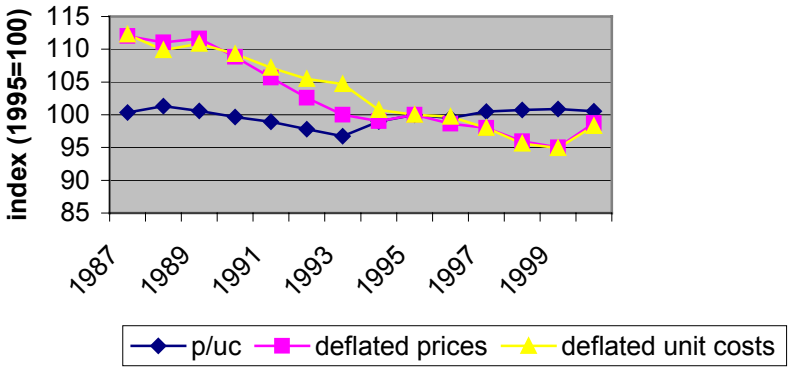
However, other events may also have incited manufacturing firms to increase their productive efficiency, such as the world trade liberalisation and the preparation to the implementation of the Economic and Monetary Union (EMU). The globalisation of financial markets may also have influenced the cost of capital and the search for greater productive efficiency at least in the largest quoted firms, thus playing a role in the evolution of unit production costs in the EU manufacturing industry.

4.2 Development of the price-cost margin in EU manufacturing industry

4.2.1) Descriptive analysis

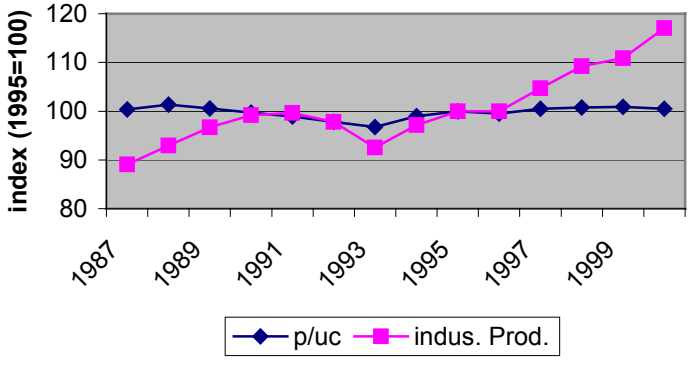
Graph 4 shows that the level of the price-cost margin (p/uc) deteriorated between 1990 and 1993, i.e. during the phase prior to the implementation of the single market, and that it then recovered as from 1994 and stabilised on a level close to that of 1989. The fall in the price-cost margin ratio between 1990 and 1993 clearly resulted from a price fall greater than the fall in unit costs in constant terms. The rise in the price-cost margin ratio in 1994 appears however to be due to a marked reduction of unit costs and not to a price rise. Thereafter, price and unit cost trends are similar and the mark-up ratio increased slightly between 1997 and 1999 only because the fall in unit costs was greater than the drop in prices in constant terms. These results are in line with the thesis according to which the completion of the single market programme first had a short-term negative impact on the level of the mark-up ratio (price effect), then a medium-term opposite effect (productive efficiency effect) (Dierx et al., 2003). Falling price-cost margins occurred however in the pre-completion phase (1989-1992), as noted by Bottasso and Sembenelli (2001) for Italian firms and by Allen et al. (1998) for the EU manufacturing industry, and rising price-cost margins as from the completion of the single market programme.

Graph 4: Evolution of prices, unit costs and price-costs margin ratio (p/uc)



Conclusions drawn from graph 4 have to be put into perspective because of the influence the economic cycle may exert on the price-cost margin ratio. Graph 5, which presents both the price-cost margin and the industrial production evolutions in the EU manufacturing industry, seems to indicate that the price-cost margin had a pro-cyclical behaviour during the 1990s, since it fell between 1990 and 1993 when manufacturing production declined, and went up thereafter in line with the recovery and the strong growth of the latter as from 1994. Thus, the fall in price-cost margins between 1990 and 1993 could be explained at least partly by the deterioration of the economic situation, and symmetrically the rise in price-cost margins in 1994 and 1995 could partly be explained by the economic upturn during this period of time.

Graph 5: evolution of the price-costs margin ratio and of the manufacturing industry production



4.2.2) Estimation of the price-cost margin ratio evolution adjusted for the influence of the business cycle.

The conclusions drawn from the graphical analysis indicates that the price-cost margin evolution is influenced by the business cycle. Consequently, if one tries to isolate the sole effects of the implementation of the SMP on the price-cost margin evolution in the EU manufacturing industry, one has to estimate the evolution of the latter ratio adjusted for the influence of the business cycle. To do that, a regression analysis (model 1) is made with the price-cost margin index as the dependent variable and the business cycle as an explanatory variable.

The following equation was estimated:

$$Log(MUi) = \alpha_1 \, log(Bci) + Cst + \varepsilon \qquad (2)$$

Where MUi and BCi correspond respectively to the price-cost margin index and the business cycle index.

Table 4 shows the results of the estimation of equation (2).

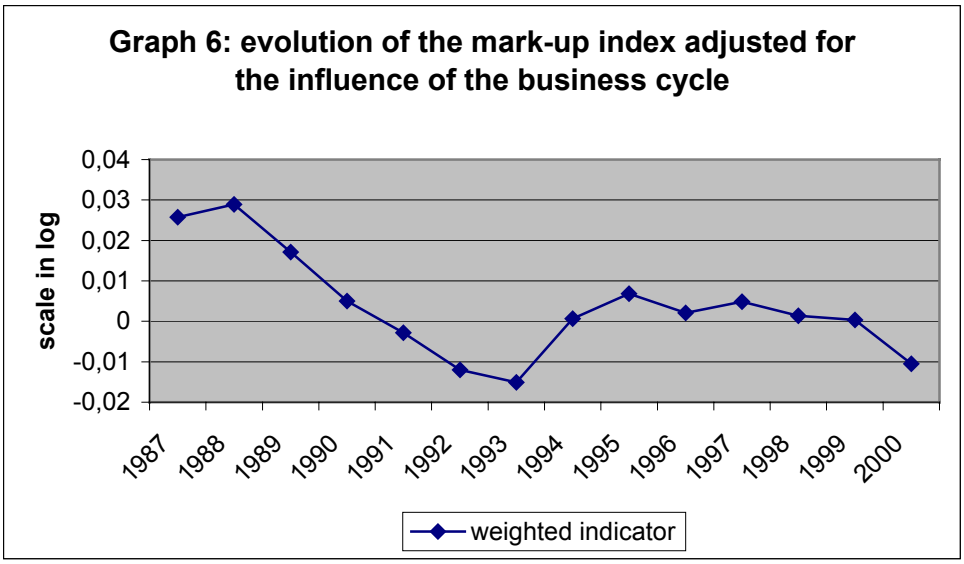
Table 4: regression analysis on the price-cost margin index (log) with the business cycle as explanatory variable

Variable (indexes; log)	Model 2 (N=104)
Business cycle	0.143*** (0.014)
Constant	3.937*** (0.067)
F value	96.700***
Adj. R^2	0.481

*** sign < 0.001; ** sign < 0.01; * sign < 0.05; S.E in brackets

Graph 6 shows the evolution of this adjusted price-cost margin. The indicator used[10] is weighted on the basis of the share of each national manufacturing industry in the combined value added of the manufacturing industries of the 8 countries.

[10] See table 2 for the method of computation of this indicator.



Graph 6 shows that there has been a substantial decline in the price-cost margin ratio adjusted for the business cycle from 1989 to 1993. This result then confirms the conclusions drawn from the previous descriptive and correlation analyses, namely that the allocative efficiency effects of the SMP occurred as from the beginning of the implementation of the programme. During the post-completion phase (1994-2000), the adjusted price-cost margin rose in 1994 and 1995 –in line with the realisation of productive efficiency gains- and tended to fall again thereafter, thus indicating the persistence of competitive pressures in the European manufactured goods markets[11].

4.2.3) Correlation analysis

In order to confirm conclusions drawn from the previous analyses, two correlation analyses were made between the developments of the price-cost margin and those of the factors influencing it. They aim at comparing the variation of the correlation coefficients between the period prior to the completion of the single market (1987-1992) and the period after its completion (1993-2000).

However, as mentioned by Jacquemin and Sapir (1991), import competition is likely to impose a major constraint on domestic firms' price-cost margins. These authors notably showed that extra-Community imports may lower the level of the mark-ups of domestic competitors. Levinson (1993), Harrison (1994) and Krishna and Mitra (1998) also report that firms set prices closer to marginal costs when they face more import competition, while Koning and Vandenbussche (2002) find evidence of market power increases when firms are protected from international competition. The intra-EU and extra-EU imports of goods excluding energy products expressed as a percentage of GDP (AMECO data) were used to test the influence of import competition on price-cost margins.

[11] This may be also partly attributable to the (preparation of the) implementation of the EMU.

Table 5: Correlation analyses with the price-cost margin index (1995=100)

Variables (indexes base 100=1995)	Period prior to the completion of the SMP (1987-1992) (N=41)	Period after the completion of the SMP (1993-2000) (N=63)
Deflated unit costs	0.005	-0.710 ***
Deflated prices	0.489 ***	-0.288 *
Business cycle	0.500 ***	0.814 ***
Intra-EU imports	-0.360*	0.459***
Extra-EU imports	-0.229	0.463 ***

*** sign < 0.001; ** sign < 0.01; * sign < 0.05

The conclusions that can be drawn from these correlation analyses are the following:

- The price-cost margin ratio appears to be pro-cyclical. Moreover, the pro-cyclical characteristic of the price-cost margin was stronger in the period prior to the completion of the SMP;

- During the period prior to the completion of the SMP, intra-EU imports and the price-cost margin ratio had opposite evolutions. This could be interpreted as a sign that the increase in intra-EU imports in this period of time exerted a pressure on price-cost margins of EU manufacturing firms, as expected (allocative efficiency gains). The influence of extra-EU imports on profit margins is less clear, as the negative coefficient is not significant at the 5% threshold.

- During the post completion phase, both intra-EU and extra-EU imports are positively and significantly correlated with the price-cost margin ratio. This counter-intuitive result could be explained by the medium-term disciplinary effects of imports and competition on EU industry efficiency: if productive and dynamic efficiency gains induced by competition are greater than the allocative efficiency gains in a medium-term perspective (Dierx et al., 2003), then the price-cost margin increases. Imports and profit margins evolutions then become positively correlated, while they were negatively correlated in the previous phase.

- The correlation analyses also support the thesis according to which the decrease in the price-cost margin ratio during the period prior to the implementation of the single market was mainly due to a drop in prices rather than to a fall in unit costs, while after the implementation of the single market, the rise in the price-cost margin ratio was more directly and more significantly correlated with a fall in unit costs.

The last three conclusions tend to confirm the thesis according to which the implementation of the single market programme first had a short-term negative impact on the level of the price-cost margin ratio (i.e. during the pre completion phase prices went down while productive efficiency did not increase), then a medium-term opposite effect (i.e. during the post completion phase productive efficiency increased and the fall in prices was more than offset by the fall in unit costs).

4.2.4) Regression analysis

The conclusions drawn from the graphs and the correlation analyses also indicate that the influence of unit costs on the price-cost margin substantially increased to the detriment of the influence of prices in the post implementation phase of the SMP in comparison with the previous phase.

In order to test the latter hypothesis, a second regression analysis was made on the price-cost margin index. The model includes the business cycle index as well as the deflated price index and the intra-EU and extra-EU imports indexes. However, the deflated unit cost index is not included in the model because it is strongly correlated with the deflated price index. Moreover, the unit cost index is also calculated with the total cost variable which is used to compute the price-cost margin ratio.

The model also includes some interaction variables between each of these explanatory variables and a dichotomic variable taking either the value 1 (period of post-completion of the single market) or zero (period prior to the completion of the single market)[12]. This analysis makes then it possible to compare the coefficients of the explanatory variables according to the time period and then to assess whether the influence of each explanatory variable has significantly changed between these two sub-periods.

4.2.5) Estimation of the price-cost margin ratio and comparison of the coefficients of the explanatory variables between the periods pre and post implementation of the SMP.

The following equations were estimated:

$$ln(MUi) = \alpha_1 ln(Pi) + \alpha_2 ln(BCi) + \alpha_3 ln(ExtraIMPi) + \alpha_4 ln(IntraIMPi) + \alpha_5 Post + Cst + \varepsilon \qquad (3a)$$

Where MUi, Pi, BCi, ExtraIMPi, IntraIMPi and Post correspond respectively to the price-cost margin index, the deflated price index, the business cycle index, the extra-EU imports index, the intra-EU imports index and a dichotomic variable taking either the value 1 (period of post completion of the single market) or zero (period of pre completion of the single market).

[12] The interaction variable takes therefore either the zero value for the years previous to 1993, or the value of the index of the explanatory variable for the years after 1993.

$$ln(MUi) = \alpha_1 log(Pi) + \alpha_2 lg(BCi) + \alpha_3 ln(ExtraIMPi) + \alpha_4 ln(IntraIMPi) + \alpha_5 ln(interactP) + \alpha_6 ln(interactBC) + \alpha_7 ln(interactExtraIMP) + \alpha_8 ln(interactIntraIMP) + Cst + \varepsilon \quad (3b)$$

Where the interaction variables are the following: interactP = deflated price index * post; interactBC = business cycle index * post; interactExtraIMP = extra-EU imports index * post and interactIntraIMP = intra-EU imports index * post.

Table 6 shows the results of these two regression analyses.

Table 6: Regression analyses on the natural logarithm of the price-cost margin index (1995=100)

Variables (indexes base 100=1995)	Model 3a (N=104)	Model 3b (N=104)
Deflated prices (ln)	0.180*** (0.034)	0.211*** (0.035)
Business cycle (ln)	0.181*** (0.022)	0.079* (0.031)
Extra-EU imports (ln)	-0.021 (0.014)	0.006 (0.028)
Intra-EU imports (ln)	0.026 (0.017)	-0.028 (0.024)
Post	0.013** (0.005)	
Price * post (ln)		-0.129*** (0.033)
Cycle * post (ln)		0.082** (0.031)
Extra-EU imports*post (ln)		-0.052 (0.032)
Intra-EU imports * post (ln)		0.103** (0.031)
Constant	2.888*** (0.193)	3.325 (0.191)***
Country dummies	yes	yes
Year dummies	no	no
Adj. R^2	0.625	0.702

*** sign < 0.001; ** sign < 0.01; * sign < 0.05; S.E in brackets

The regression analyses presented in table 6 confirm the pro-cyclical behaviour of the price-cost margin. In addition, model 3b confirms that the positive influence of the business cycle on the price-cost margin was more important in the post completion of the single market period of than it was during the previous period.

More basically, model 3b shows that the coefficient of prices substantially and significantly decreased in the post-completion period of the single market as compared with the previous period. This result thus tends to confirm the hypothesis according to which the rise in the price-cost margin during the post-completion phase of the SMP would mainly stem from the fall in unit costs. In other words, efficiency gains made by the EU manufacturing industry as from 1994 would have been used by firms to reduce prices –which can be interpreted as sign of the effectiveness of competition- but also to favour the profit margins recovery.

4.3 Country analysis

The analysis of the evolution of the price-cost margin ratio was also made at the level of each of the eight countries taken separately. This makes it possible to distinguish the countries in which the impact of the implementation of the single market was the strongest one. The corresponding graphs are presented in annex 4.

The main conclusions drawn from this country analysis are the following:

- First, in all countries except Denmark and Finland, the implementation of the single market programme has had a similar impact on the price-cost margin: the latter fell considerably in the early 1990s, rose markedly in 1994-1995 and then slightly increased between 1996 and 1999. These evolutions could then be interpreted as a sign of a rather high integration of the manufactured products markets of these various countries, even if the price-cost margin levels are still different[13]. In this respect, two countries can be distinguished: Belgium, which shows the lowest mark-up level, and France, for opposite reasons. The finding according to which price-cost margin levels in Belgian manufacturing industry are low in comparison with other countries is consistent with the conclusions of Warzinski (2002), who estimates price cost margins following the Roeger methodology and using the AMADEUS database, and of Konings et al. (2001), who notably explain the relatively low level of the mark-ups over the period 1990-1996 by the fact that Belgian firms were subjected before the introduction of the new Community legislation to an intense competition from imports, so that they were already strongly encouraged to increase their competitiveness before the implementation of the single market. Regarding France, the share in the industrial value added of the sectors that were likely to be affected by the increase in competition induced by the completion of the single market was considerable since it was estimated at the end of the 1980s at more than 53%, against 49% in Belgium (Buigues et al., 1990). Consequently, we would have expected the price-cost margin ratio of French manufacturing firms to be reduced to a greater extent than observed. The persistence of relatively high price-cost margin levels in the French manufacturing industry -a feature which is also mentioned by Warzinski (2002)- could therefore be explained by a relatively slow transposition of Community directives on the functioning of the products markets and/or by the persistence of anti-competitive practices. Thus, French manufacturing firms seem to have preserved a

[13] Results taken from the comparison of mark-up levels have to be interpreted cautiously, because of the incomplete harmonisation of the accounting items and also because of the uneven representativeness of the national samples in the BACH base.

higher market power than that of their Belgian, German, Italian, Spanish or Portuguese counterparts.

- Second, Denmark is differentiated somewhat by the fact that the developments of the price-cost margin remained positive in the period 1987-1997, which can be interpreted as a sign of insufficient competition in manufacturing products markets and therefore as a sign of the ineffectiveness of the single market programme during this decade. This can be explained by the fact that the sectors of the Danish industry which were considered as being likely to be affected by the increase in competition induced by the completion of the single market hardly reached 40% of industrial value added at the end the 1980s –i.e. the lowest level in Europe - and among these sectors, the ones which were considered as being likely to be strongly affected by an increase in competition did not represent more than 11% of the industrial value added (Buigues et al., 1990).

- The third conclusion drawn from the graphs presented in annex 3 is that Finland is differentiated distinctly from the other countries by a positive trend of the price-cost margin ratio over the period 1992-2000 and also by the fact that the developments of the latter ratio as from 1995 seem to indicate the persistence of market power. The case of Finland is however somewhat particular. Indeed, as underlined by Ripatti and Vilmunen (2001), the Finnish economy experienced a deep recession in the early 1990s owing to the sharp drop in the volume of trade with the former Soviet Union consecutive with both currencies becoming convertible in 1991. This would explain the fall in the mark-up during this period of time. As from 1994, the Finnish economy benefited again from high growth levels, mainly thanks to the ICT sector which developed quickly, while the return to increasing mark-ups levels occurred from 1992 onwards. According to Ripatti and Vilmunen, the explanation to the latter phenomenon is twofold: on the one hand, the rise of the mark-ups during this period would be partly due to the growing influence of financial markets, which would have resulted in the demand for high returns on investment; on the other hand, the increasing differentiation of Finnish products –which was made possible thanks to the innovations induced by the information and communication technologies- allowed for high mark-ups levels. The latter point seems to be important because, as underlined by Oliveira Martins et al. (1996), the higher the sunk costs (research and development expenses, marketing expenses), the more necessary it is to increase prices to support the competitive effort, and the higher the innovation rents and the mark-ups. Thus, the rise in the price-cost margin ratio between 1992 and 2000 in the Finnish manufacturing industry could be explained -at least partly- by the growing importance of the ICT sectors in the Finnish industry together with the strong economic upturn which occurred in this period of time.

- Lastly, the impact of the implementation of the single market on competition seems to have been stronger in Portugal and Spain than in the other countries, since price reductions were more important in these two countries over the studied period of time. This probably comes from the fact that in the early 1990s the most competitive manufacturing sectors in these countries faced serious competition from products from developing countries (Buigues et al., 1990). Thus, Portuguese and Spanish manufacturing firms were faced with strong competition because of the conjunction of the completion of the Internal Market and world trade liberalisation.

5. Conclusion

The aim of this study was to assess, by using the BACH database on the harmonised accounts of European companies, the impact of the implementation of the single market on price-cost margins, prices and productive efficiency in the EU manufacturing industry and thus to provide an estimate of the effectiveness of the measures adopted under this programme. The main conclusions of this analysis are the following:

- First, there has been a substantial increase in the productive efficiency of EU manufacturing firms in the post-implementation phase of the SMP;

- Second, concerning the evolution of price-cost margins, two phases have to be distinguished. At first (1989-1993), the increase in competition –which was effective from the pre implementation phase of the single market- would have resulted in a considerable fall in the price-cost margin levels in EU manufacturing industry. During this period of time, the fall in the price-cost margin was mainly due to a decrease in prices greater than that of unit costs. Subsequently (as from 1994), price-cost margin ratios increased thanks to the conjunction of the realisation of important efficiency gains in the EU manufacturing industry and of the economic upturn, while prices remained stable overall. Therefore, the decrease in unit costs was the key element of the profit margins recovery during this second phase. On the whole, the situation prevailing at the end of the period appears better than in the beginning, insofar as profit margins recovered after the initial shock induced by the implementation of the single market, while prices in real terms declined.

- Third, the implementation of the SMP seems to have had different effects on the price-cost margin levels of manufacturing firms according to the country. In particular, the impact of the SMP on competition seems to have been less effective in the Nordic countries, and especially in Finland, than in the other countries.

Finally, the limitations of this study have to be underlined. First and above all, the main limitation stem from the fact that it was not possible to assess what would have happened in the absence of the implementation of the SMP. Moreover, part of the evolutions observed regarding productive efficiency and price-cost margins may also have resulted from events which are not directly linked to the implementation of the SMP, such as the world trade liberalisation or the implementation of the EMU. Second, another limitation of this study pertains to the use of data aggregated at the manufacturing industry level. Because of the fact that there is no correspondence between the sectoral breakdown available in BACH and the NACE rev1 sector classification, which is used in other economic databases such as AMECO or NEW CRONOS, the analysis had to be made at the manufacturing industry level of each country. However, it would have been much more interesting to focus on the sectoral level because productive efficiency and profits may vary a lot from one sector to another. The third limitation of this study stems from the still incomplete harmonisation of the accounting items and also from the uneven representativeness of the national samples in the BACH database. For this reason, only trend comparisons are suitable while the calculation and comparison of the mark-ups and of the productive efficiency between countries in terms of level have to be interpreted cautiously.

Annex 1: methodology

1) Calculation of the growth rate of unit production costs

(1) First step: calculation of the growth rate of the sold quantities.

With P = prices and Q = sold quantities; then:

$\Delta PQ/ PQ = (PQ_{n+1} - PQ_n) / PQ_n$

$= (PQ_{n+1} / PQ_n) - 1$

$= (P_{n+1} / P_n * Q_{n+1} / Q_n) - 1$

$\Leftrightarrow (\Delta PQ/ PQ) + 1 = (P_{n+1} / P_n * Q_{n+1} / Q_n)$

$\Leftrightarrow [(\Delta PQ/ PQ) + 1] * [P_n / P_{n+1}] = \mathbf{Q_{n+1} / Q_n} = (\Delta Q / Q) + 1$

$\Leftrightarrow [(\Delta PQ / PQ) +1] * [P_n / P_{n+1}] - 1 = \Delta Q / Q$

(2) Second step: calculation of the growth rate of unit production costs.

With UC = unit cost[14]; then: TC = total costs = UC * Q

$(TC_{n+1} / TC_n) * \mathbf{(Q_n / Q_{n+1})}$[15] $= UC_{n+1} / UC_n = (\Delta UC / UC) + 1$

$\Leftrightarrow [(TC_{n+1} / TC_n) * (Q_n / Q_{n+1})] - 1 = \Delta UC / UC$

2) Calculation of the P/UC ratio

P/UC = PQ/TC

3) Calculation of the total cost of the sold quantities (TC)

Variable charges (intermediate consumption + staff costs) + fixed production charges (depreciation on fixed assets + interest paid on financial debts) – variations in stocks + (other operating costs – other operating incomes).

The latter member was added in the calculation because of accounting particularities in Germany and in Finland, which include part of the variable charges in the item "other operating costs". Moreover, this item includes operating taxes, which have to be considered as (fixed or variable) charges. In addition, the item "other operating incomes" has to be taken into account because it notably includes subsidies, which have to be deducted from costs.

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[14] This is unit cost of the sold quantities. Cf. method of calculation of total cost of the sold quantities.

[15] **$(Q_n / Q_{n+1}) = 1 / [Q_{n+1} / Q_n] = 1 / [(\Delta Q / Q) + 1]$**

Annex 2: Regression analysis – Equation 1

Table : regression analysis on the unit production costs index (ln) with control variables only

Variables (indexes; ln)	Model 1 (N=104)
Raw materials prices	0.078* (0.032)
Inflation	0.533*** (0.0288)
Constant	1.787*** (0.173)
F value	199.830***
Adj. R^2	0.794

*** sign < 0.001; ** sign < 0.01; * sign < 0.05; S.E in brackets.

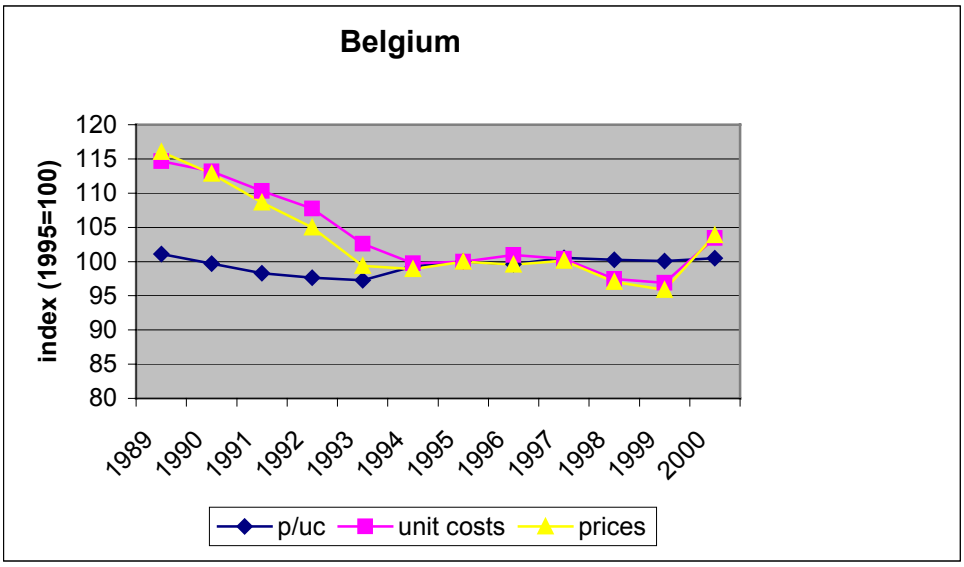
Annex 3: Correlation matrix

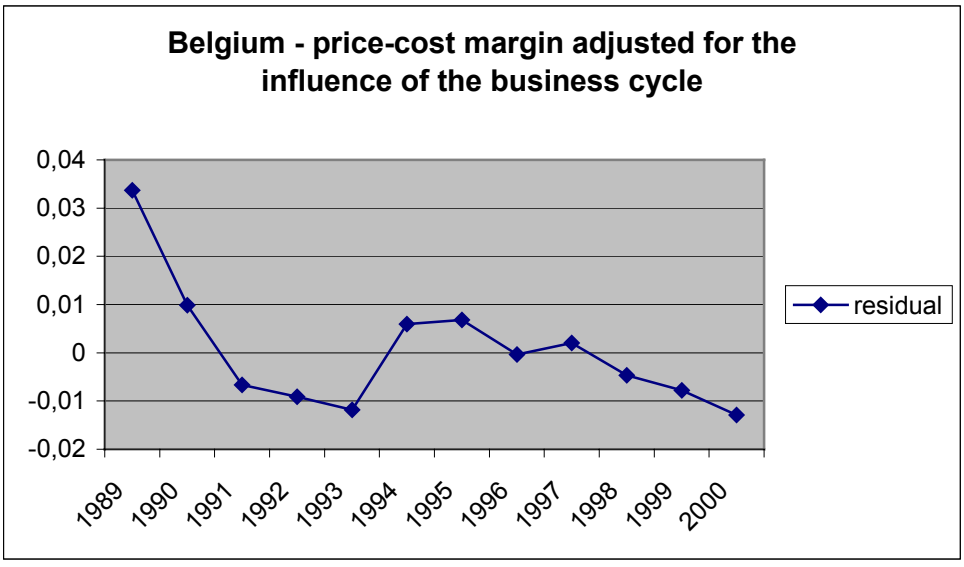
Correlation matrix

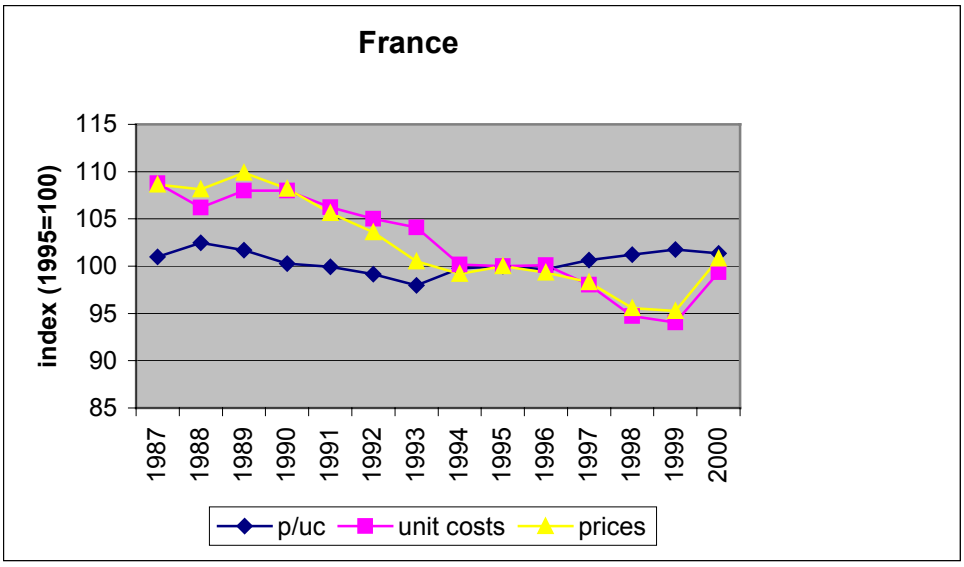
Variables	P/UC	Deflated unit costs	Deflated prices	Business cycle	Extra-EU imports	Intra-EU imports
P/UC	1.00					
Deflated unit costs	-0.409***	1.00				
Deflated prices	-0.073	0.937***	1.00			
Business cycle	0.686***	-0.588***	-0.397***	1.00		
Extra-EU imports	0.315**	-0.300**	-0.244*	0.654***	1.00	
Intra-EU imports	0.174	-0.179	-0.172	0.470***	0.865***	1.00

*** sign < 0.001; ** sign < 0.01; * sign < 0.05

Annex 4: country analysis






France
index (1995=100)
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110
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100
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90
85
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1991
1992
1993
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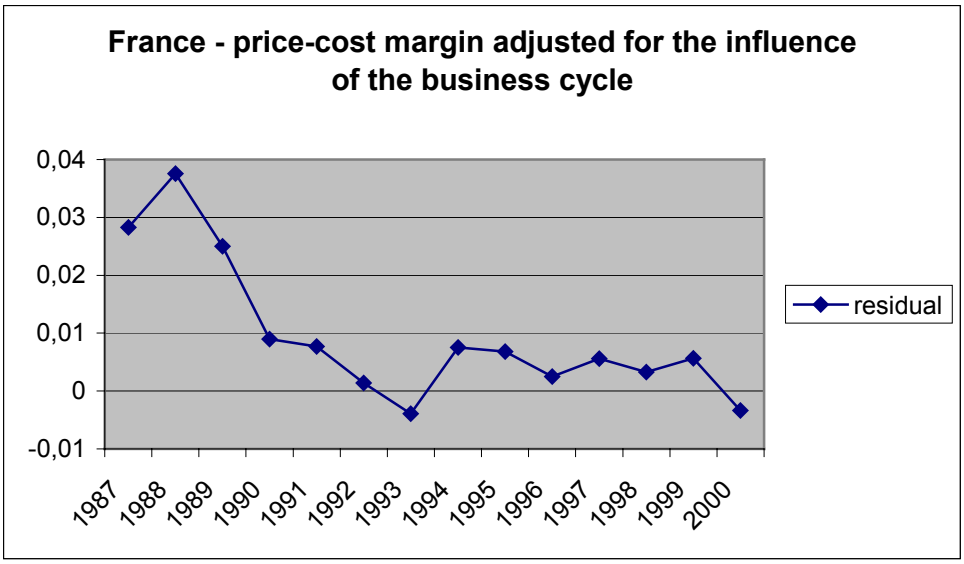
1995
1996
1997
1998
1999
2000
p/uc
unit costs
prices


France - price-cost margin adjusted for the influence of the business cycle
0,04
0,03
0,02
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-0,01
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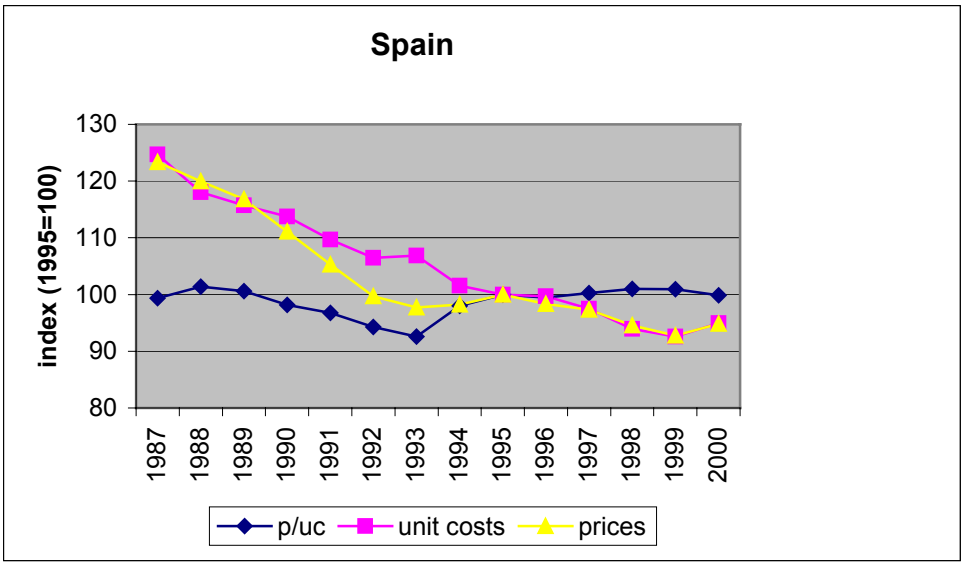
Spain
index (1995=100)
130
120
110
100
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80
1987
1988
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1995
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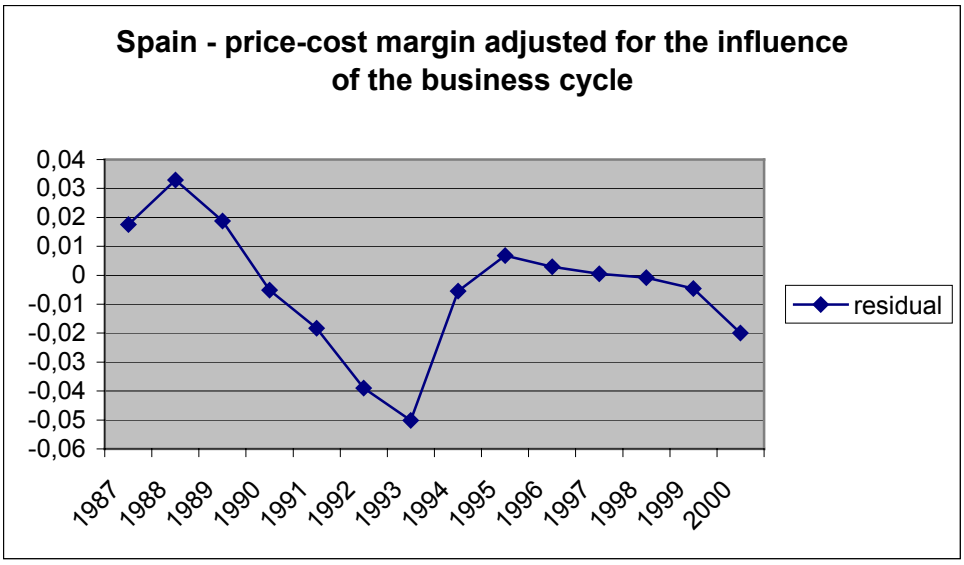
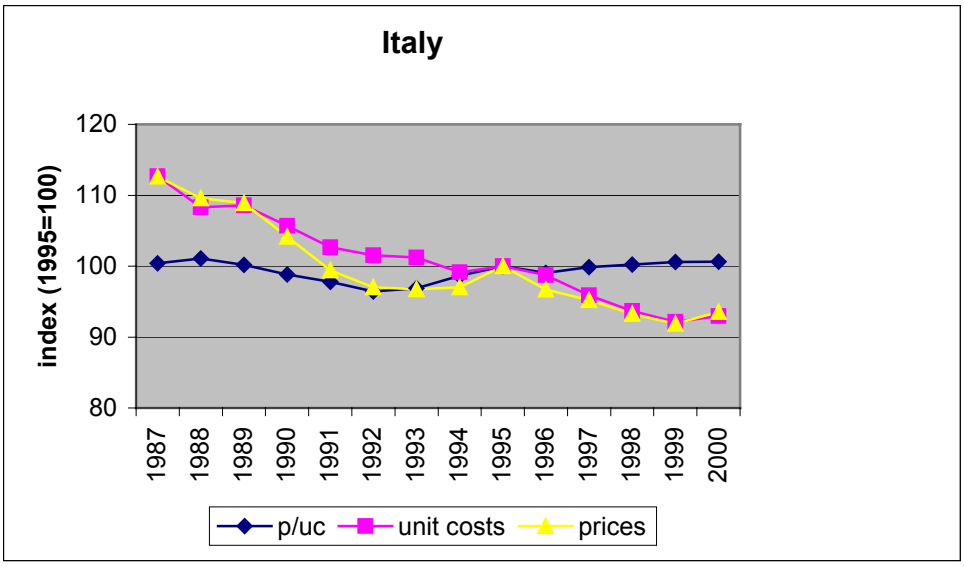
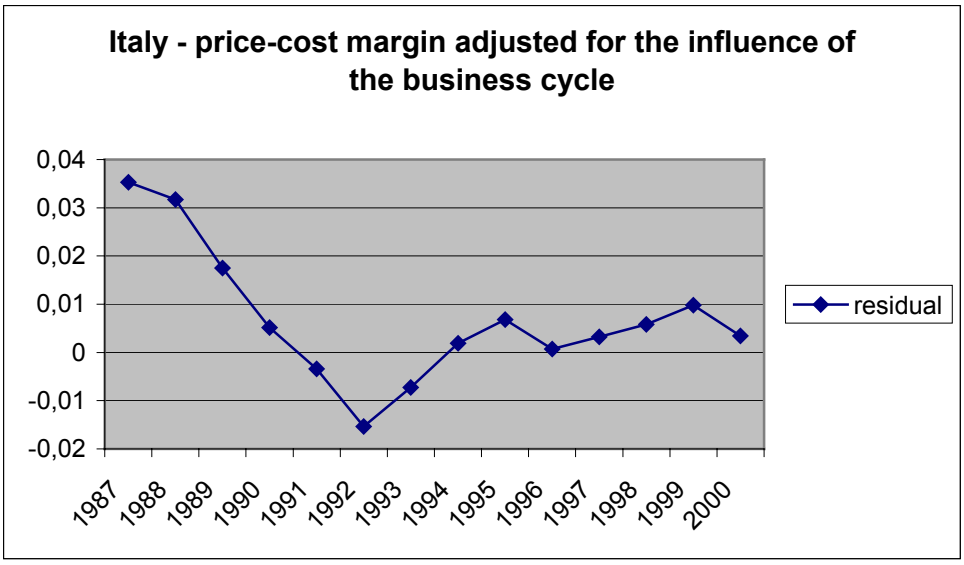
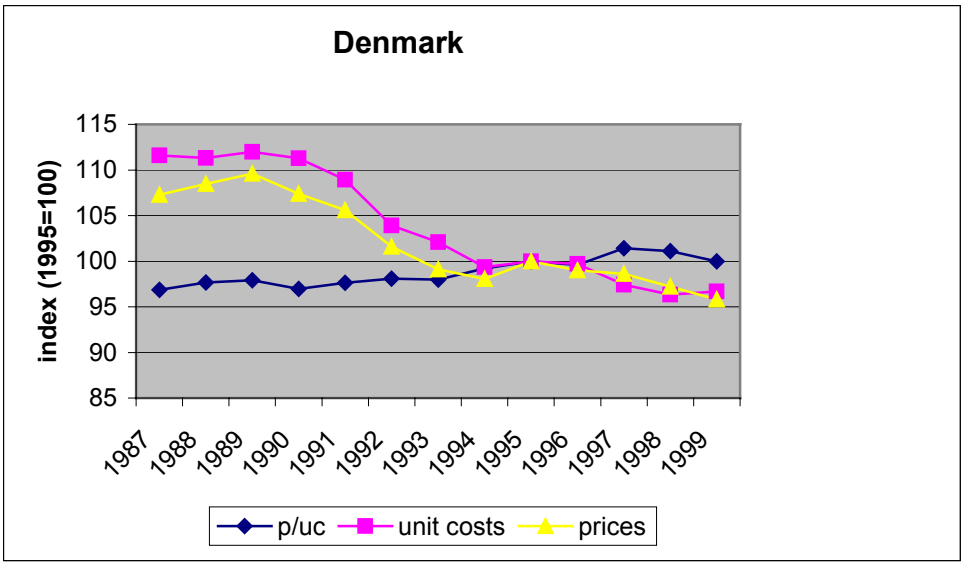
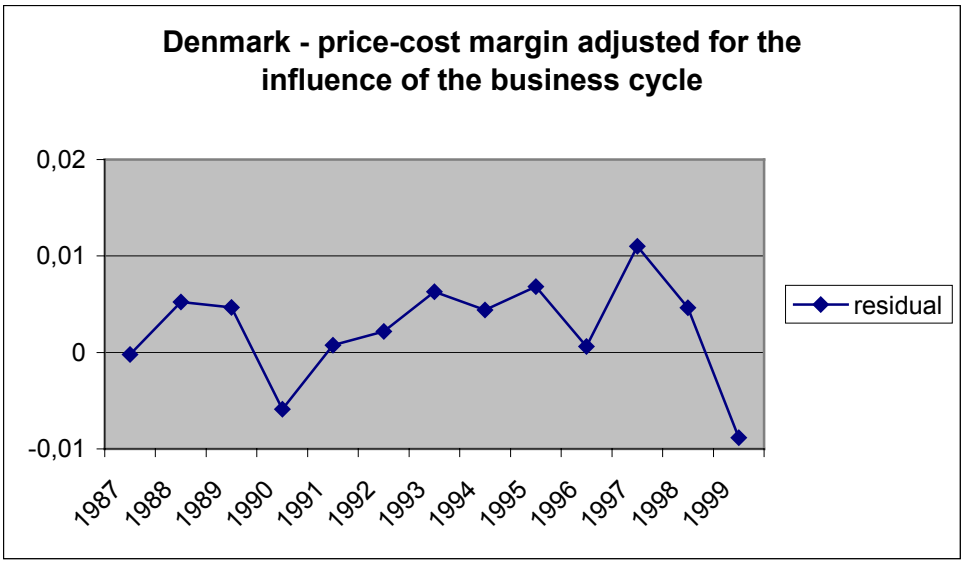
1998
1999
2000
p/uc
unit costs
prices

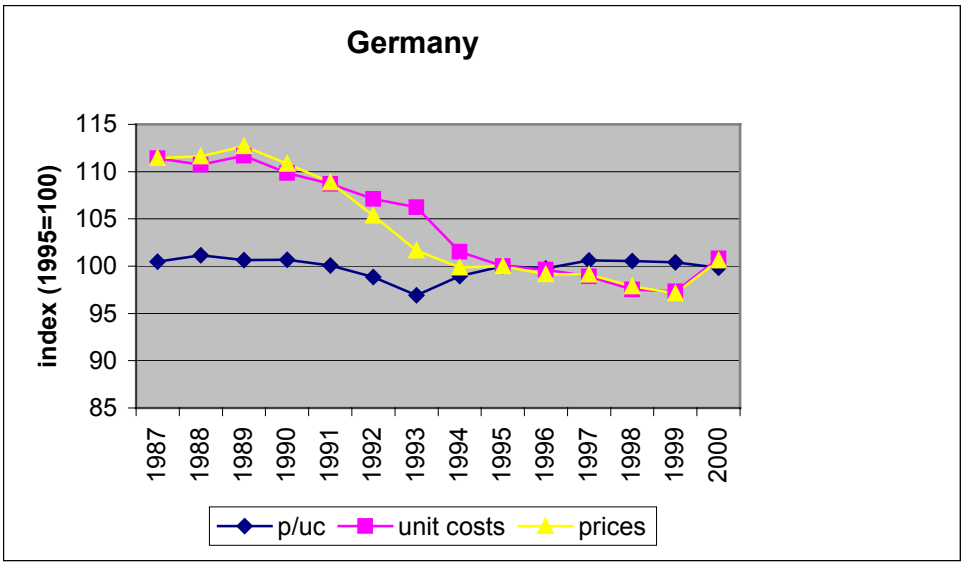

Spain - price-cost margin adjusted for the influence of the business cycle
0,04
0,03
0,02
0,01
0
-0,01
-0,02
-0,03
-0,04
-0,05
-0,06
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
residual

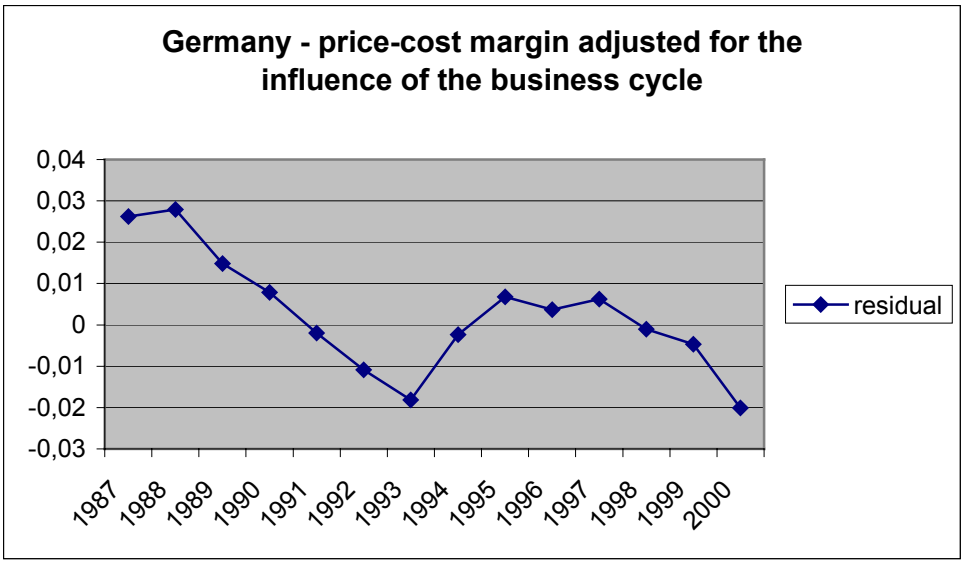

Italy
index (1995=100)
120
110
100
90
80
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
p/uc
unit costs
prices

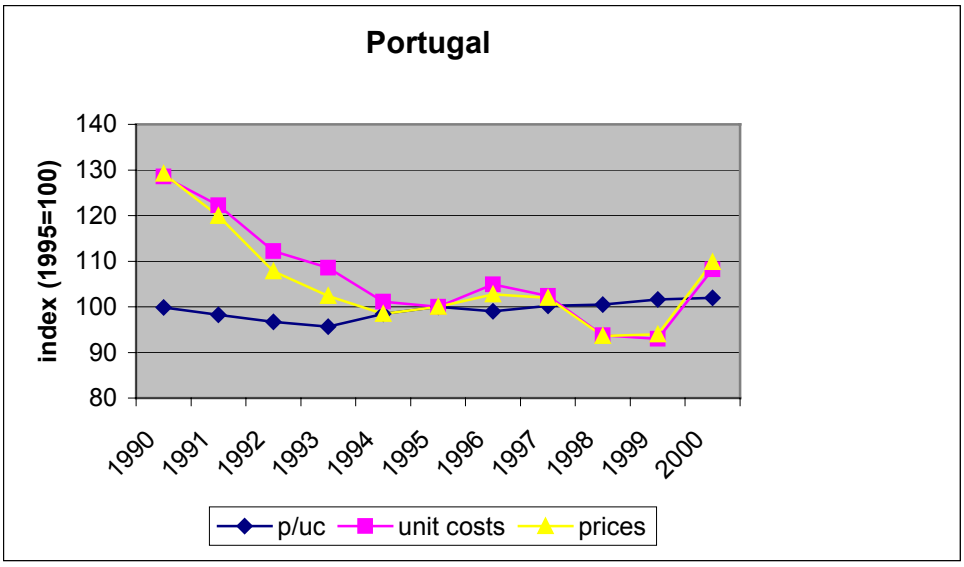

Italy - price-cost margin adjusted for the influence of the business cycle
0,04
0,03
0,02
0,01
0
-0,01
-0,02
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
residual

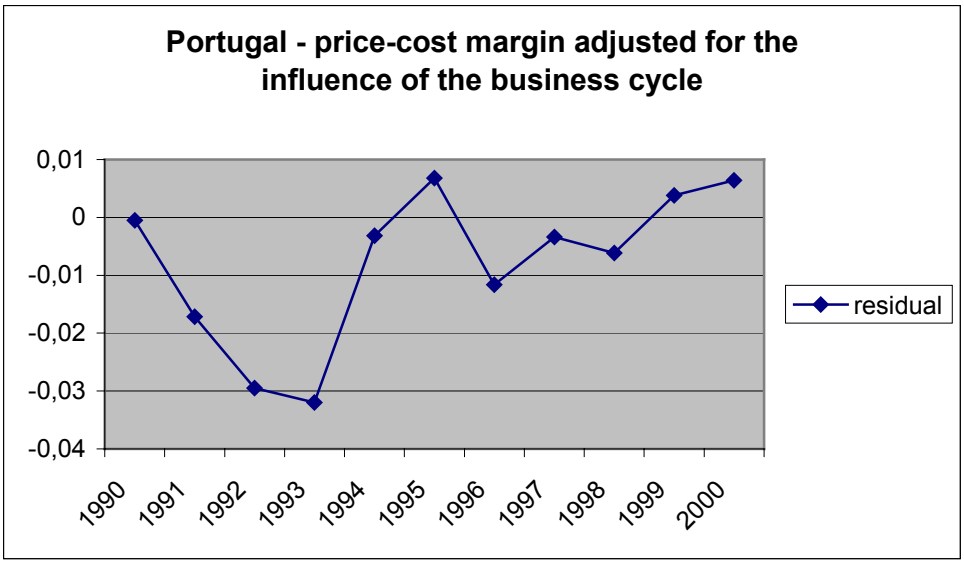

Denmark
index (1995=100)
115
110
105
100
95
90
85
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
p/uc
unit costs
prices

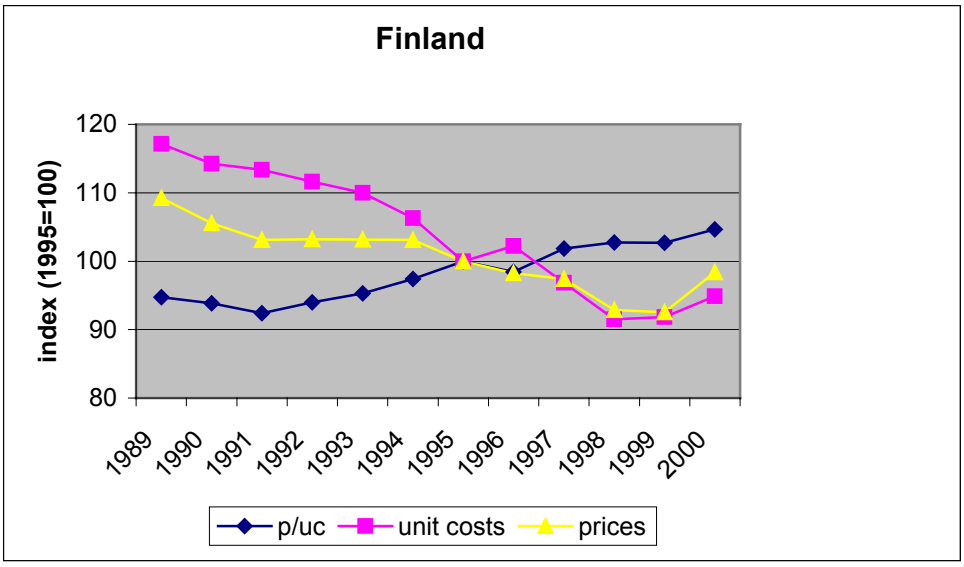

Denmark - price-cost margin adjusted for the influence of the business cycle
0,02
0,01
0
-0,01
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
residual

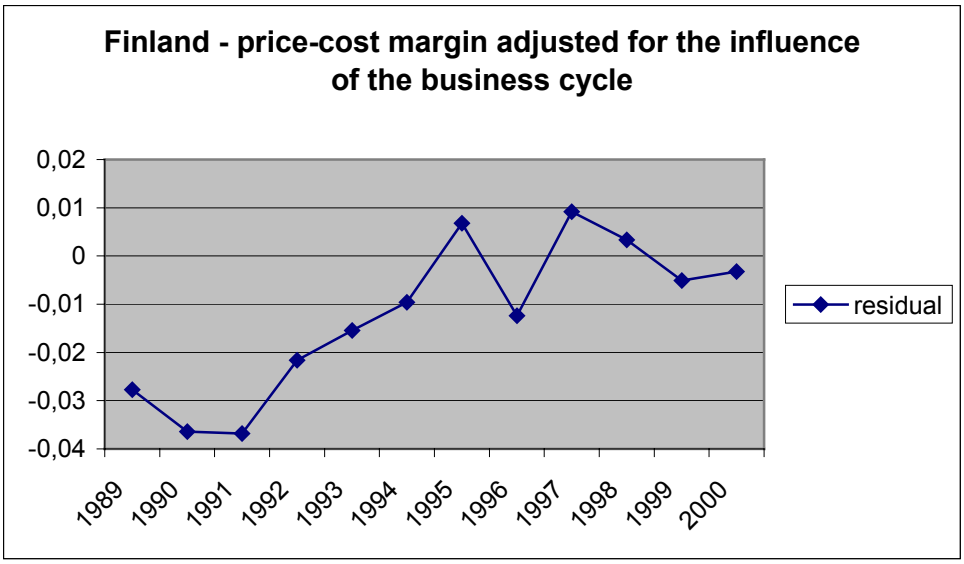

Germany
index (1995=100)
115
110
105
100
95
90
85
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
p/uc
unit costs
prices

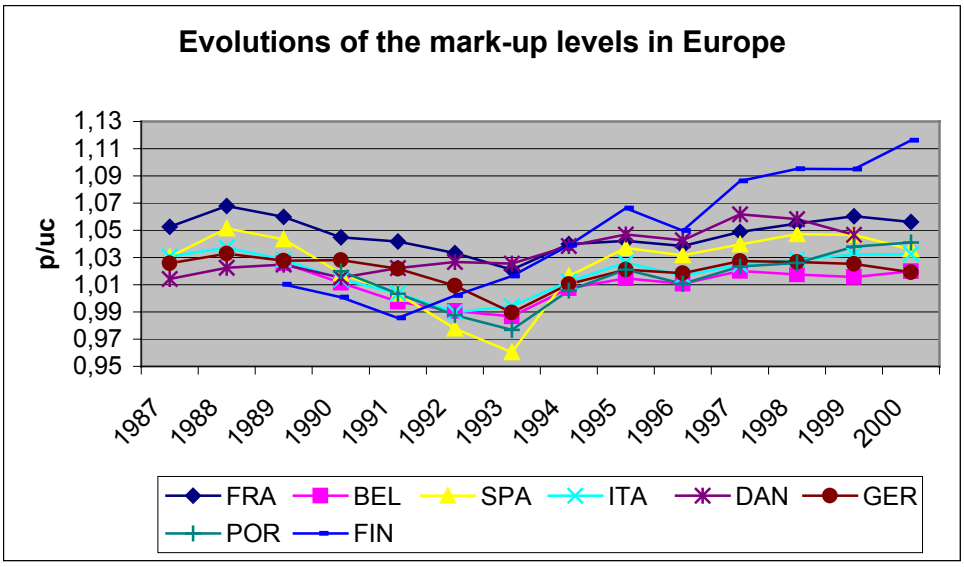

Germany - price-cost margin adjusted for the influence of the business cycle
0,04
0,03
0,02
0,01
0
-0,01
-0,02
-0,03
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
residual


Portugal
index (1995=100)
140
130
120
110
100
90
80
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
p/uc
unit costs
prices


Portugal - price-cost margin adjusted for the influence of the business cycle
0,01
0
-0,01
-0,02
-0,03
-0,04
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
residual


Finland
index (1995=100)
120
110
100
90
80
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
p/uc
unit costs
prices


Finland - price-cost margin adjusted for the influence of the business cycle
0,02
0,01
0
-0,01
-0,02
-0,03
-0,04
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
residual


Evolutions of the mark-up levels in Europe
p/uc
1,13
1,11
1,09
1,07
1,05
1,03
1,01
0,99
0,97
0,95
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
FRA
BEL
SPA
ITA
DAN
GER
POR
FIN

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